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Weekly Bulletin

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The Plague Situation

By W. H. Kellogg, M.D., Chief, Division of Laboratories.

It is now just forty years since the present pandemic of plague began with the appearance of an epidemic in Hong Kong and it is just thirty-four years since it reached California. Arriving in India from Hong Kong it found favorable conditions and soon after 1900 the deaths reached a million per year. Even now, after nearly forty years of continuous activity, the deaths from plague in India are occurring at the rate of three to four thousand per week. Considered in the light of the known history of plague there is nothing unusual in these facts, nor is there in the length of time it has been continuously present in California any ground for believing that it is dying out and will shortly disappear. It is characteristic of plague that its period is very slow and the rise and fall of epidemics is measured in decades and centuries. Upon its appearance in a country it is sometimes years before its presence is manifested by any great mortality and in the subsidence of a pandemic its final disappearance is interrupted by sporadic localized outbreaks. The long range periodicity of plague, as well as its persistence, is well shown in the history of plague in England where it finally disappeared in 1680 after its almost continuous presence for 136 years. The Great Plague of London occurred in 1665 with about 70,000 deaths, but there had been previous to that time and within the 136 year period five epidemics of from 10,000 to 35,000 deaths at intervals of thirty, ten, twenty-two, eleven and thirty years.

The following quoted from Procopius of Caesarea in his History of the Persian Wars describing the pandemic of the sixth century, which is the first authentic historical pandemic, is interesting in its parallelism with more modern appearances. "It arose in Egypt with the inhabitants of Pelusium, then dividing spread one way through Alexandria and the rest of Egypt, the other into Palestine which borders on Egypt, and then traveled over the world always advancing with a progress marked by certain definite spaces of time. For it seemed to advance by a certain law and to demand a certain space of time in every country, discharging its venom against no one on the way casually, but spreading on this side and on that to the uttermost ends of the world as if it feared lest incautiously it should pass by any corner or recess upon earth. It spared neither island nor cave nor mountain top where man dwelt. If it passed over any place only slightly or mildly touching the inhabitants, it returned there afterwards leaving untouched the neighbors against whom it had spent its rage before and it did not depart from there before it made up the full measure of the dead in proportion to the amount of destruction which it had brought on its neighbors. Always beginning at the sea coast it spread into the interior. In the second year it reached Byzantium about the middle of the spring where, as it happened, I was staying."

The great epidemics of ancient times seem to have been of the bubonic form, although it must be remembered that historical accounts of plagues include all epidemic disease, typhus, smallpox, etc., as fell as plague, and it is only the description of buboes by some of the writers that identify bubonic plague. Pneumonic plague might have occurred, but for authentic accounts of pneumonic plague epidemics we have only comparatively small outbreaks in recent years in Manchuria, in limited districts of India, and on a still smaller scale in California. There are, however, references seeming to indicate that pneumonic plague accompanied some of the bubonic outbreaks and therefore doubtless occurred alone.

Guy de Chauliac in his description of the plague at Avignon which was part of the second historical pandemic in the fourteenth century says: "The plague commenced with us in January, it continued seven months during which time it appeared in two forms. During the first two months it was accompanied with a continuous fever and with a coughing of blood. All who were attacked died in three days. During the other months the continuous fever was accompanied with tumors and boils which appeared in the external parts of the body, chiefly in the arm pits and in the groin. Those who were thus attacked died in five days."

With illness of the individual, the prognosis is of great interest and importance to him. So also with the commonwealth, when plague is endemic a prognosis is of interest. Reviewing the past history of the disease an attempt may be made to predict what the future has in store for California and for the rest of the nation. It soon develops, however, that about the only thing that is certain about plague is the uncertainty of its disappearance and that usually about a century is required for it to finally flicker out. This is the history of human epidemics. But how about the endemic foci where plague lies dormant during the intervals between epidemic or pandemic spread? The natural reservoir of plague is in wild rodents of squirrel or ground hog type and the historical foci are districts in Arabia along the Red Sea, in Mesopotamia, in Thibet, in Yunnan in China, and in Uganda in Africa. More recently endemic foci have been established in Manchuria from which point the pneumonic epidemics of 1910 and 1916 originated, and in California where the native rodent concerned is the ground squirrel, citellus Beechii. The rat as a carrier of plague seems to be subject to the rise and fall of epidemics the same as his human associate. When plague disappears from a human population it leaves the rat population also, but the enzootic does not exactly coincide with the epidemic. It usually precedes it and is likely to linger longer. The source of human bubonic outbreaks is the rat and the source of rat plague is doubtless contact with wild rodents in some endemic focus. The primary source of plague, therefore, is the wild native rodent and the distributor is the rat who travels in ships and visits all lands. The rat occasionally returns the infection to wild rodents in some new locality, thus establishing a new endemic focus. This happened in California shortly after the introduction of plague into San Francisco about 1900,* and presumably the point of contact was in the vicinity of the Port Costa warehouses. At any rate squirrel plague was first found in that vicinity, and the enzootic soon reached large proportions.

The record of plague in California is briefly as follows:

March, 1900. Bubonic plague appeared in San Francisco principally in the Chinese colony and a total of 121 cases with 113 deaths occurred over a period of four years.

May, 1907. Bubonic plague again appeared in San Francisco. The total number of cases in this outbreak over a period of six months was 160 and the deaths 78. This time not confined to Chinatown, but scattered over the whole city.

August, 1908. Plague proven to be present among the ground squirrels of Contra Costa County.

May, 1907, to December, 1918. Sporadic cases of human plague to the number of 11 with 5 deaths occurred in the counties of Alameda, Contra Costa, San Benito, Santa Clara, San Joaquin and Stanislaus. Squirrel plague found to be present in the same counties as well as in Fresno, Monterey, San Luis Obispo, Santa Cruz, San Mateo, Merced, and San Francisco.

August, 1919. An outbreak of pneumonic plague in Oakland which consisted of 13 cases with 12 deaths.

1919 to 1924, inclusive. Six sporadic cases with two deaths occurred in Alameda, Monterey, San Benito and Santa Cruz counties.

October, 1924. An outbreak of pneumonic plague in Los Angeles with 32 cases and 30 deaths.

November, 1924. Five cases of bubonic plague with three deaths in Los Angeles County.

1925 to 1933. Seven sporadic cases with five deaths in the counties of Los Angeles, Santa Cruz, Monterey and Santa Barbara.

1934. One human case in Tulare County. Also a large epizootic among ground squirrels of Tulare and Kern counties, over 200 positive specimens being found among those sent to the laboratory. Furthermore, an epizootic was discovered among the ground squirrels of Modoc County in the northeastern corner of the State on the eastern side of the Sierras.

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* Kellogg: Present Status of Plague with Historical Review. American Journal of Public Health, November, 1920.

This chronology of plague in California shows that we have had two bubonic epidemics, the first in San Francisco from 1900 to 1904 and the second in San Francisco and Oakland in 1907 and 1908. We have had two pneumonic epidemics, the first in Oakland in 1919 and the second in Los Angeles in 1924. We have had in all thirty-five sporadic cases with nineteen deaths, mostly in rural districts and of squirrel origin, nine counties being represented. Squirrel plague has been found in seventeen counties.

The plague situation on the west coast is of interest to health authorities throughout the country as will be appreciated by a consideration of what the possible answer is to certain questions which immediately present themselves. These questions are: First, what is the probability of plague dying out before long? Second, what is the significance of ground squirrel infection? Third, is plague in California a menace to other States? The answer to the first question is written in the history of plague and from the brief references to that history already quoted in this paper it may be suspected that the chapter is not finished and may not be for many years to come. This is made all the more certain when it is remembered that there is every reason for believing that the historical epidemics and endemics were rat borne and in course of time they did come to an end, whereas plague has been kept alive continuously in particular habitats where the rodent concerned was not the rat but a wild native animal such as the marmot. In these localities plague has not so far as anyone knows ever completely disappeared. Such a focus now exists in the California ground squirrel.

In the answer to the second question we find the most disquieting aspect of the whole problem. In rat plague pneumonia is not a common finding. Guinea pigs inoculated from rats rarely show lung involvement. In squirrel plague pneumonia is common. Guinea pigs inoculated from squirrels very frequently present a pneumonia. The Oakland outbreak of thirteen pneumonic cases, which group by the way included two nurses and two doctors, was started by contact with squirrels, the first man having been squirrel hunting just before his onset. His case was primarily bubonic (axillary) with pneumonia supervening. The Los Angeles epidemic is not so easily traced to squirrels although in the rodent survey following, both rats and squirrels were found infected. There would seem, therefore, to be some ground for the theory that pneumonic plague is the result of a development of a specific organ virulence on the part of the prevailing strain of b. pestis by passage through a particular species of rodent. In this connection Dr. Wu Lien Teh says:* "The idea that the species of rodents involved in the epizootic might influence the character of subsequent epidemics is a very fascinating one. Especially it has to be considered if a close relation does exist between epizootics in certain wild rodents and human outbreaks of pneumonic plague. In fact, a world wide study of the disease both in rodents and in man as undertaken by our staff within recent years has yielded many data supporting this view. On the other hand, in some countries where only ordinary rats are involved the incidence of lung pest is conspicuous also. But before reaching any final conclusions the following points should be considered: (1) Though ordinary rats are sometimes found to be the original source of pneumonic outbreaks, in many instances the local rodents were not involved, the disease having been imported from outside by human agency, namely, by travelers incubating the disease. (2) How long has the disease existed in the local rats? In some plague areas with rat epizootics pneumonic plague was frequent soon after the introduction of infection but became rarer afterwards. One might consequently suggest that the longer the infection continues among ordinary rats the less chance there is for pneumonic plague to appear to man." Finally, the significance of ground squirrel infection, leaving out of consideration any bearing it may have on the type of human plague, lies in the fact that a new endemic focus has been established and these endemic foci, constituted as they are by wild rodent infection, are so far as anyone knows at present permanent and everlasting.

The third query, "Is plague in California a menace to other States?", I would answer by saying "Yes" and for the following reasons: (a) Because of the possibility of direct extension of the disease in the wild rodent population across State lines. We have recently discovered plague among the ground squirrels of Modoc County, 400 miles from the nearest previously known plague area and close to the State lines of both Oregon and Nevada. For all we know it has already crossed over into both States. (b) It may travel by transference to the rats in some borderline urban area, the rats traveling, as is their wont, in freight cars or ships to new and distant localities. (c) The last reason to be mentioned necessitates a return to the epidemiology of pneumonic plague. Teague and Barber * as a result of their investigations in Manchuria believe that the essential conditions for a rapid spread of pneumonic plague are a low temperature with considerable humidity, thus permitting droplets containing plague bacilli to remain suspended in the air a longer time and at the same time preserving them against the destructive influence of warmth and drying. They point out that the greatest pneumonic epidemic of modern times occurred in Manchuria in the winter of 1910-11 when the temperature was many degrees below zero Centigrade; also that in India only two to five per cent of the cases are pneumonic and no large pneumonic outbreaks have occurred there except one of 1400 deaths in Kashmir at an elevation of about five thousand feet and in very cold weather. If we accept the plausibility of Teague's and Barber's thesis we must admit the possibility of some person during the incubation period of plague traveling East in the winter time. Should this traveler develop an axillary or cervical bubo with a secondary pneumonia, the stage will be set for a rapid man to man transfer of a form of the disease that has no rival in the rapidity of its spread and the certainty of a fatal outcome.

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* Reports of North Manchurian Plague Prevention Service, 1927-8.

* Philippine Journal of Science, 1912, page 157.

MORBIDITY

Complete Reports for Following Diseases for Week Ending April 17, 1937

Chickenpox

997 cases: Alameda County 7, Alameda 22, Albany 2, Berkeley 28, Emeryville 1, Oakland 40, Contra Costa County 5, El Cerrito 2, Pittsburg 11, Fresno County 17, Fresno 18, Sanger 2, Eureka 14, Holtville 1, Imperial 2, Kern County 21, Bakersfield 3, Kings County 1, Los Angeles County 74, Alhambra 3, Burbank 4, Compton 9, Culver City 1, Glendale 5, Huntington Park 12, Inglewood 1, Long Beach 19, Los Angeles 89, Monrovia 2, Pasadena 25, Pomona 5, Santa Monica 7, Sierra Madre 1, South Pasadena 3, Torrance 1, Lynwood 1, Madera County 1, Monterey County 18, Soledad 9, Napa County 17, Napa 23, Orange County 13, Anaheim 5, Fullerton 5, Newport Beach 1, Santa Ana 7, Colfax 1, Riverside County 32, Corona 4, Riverside 36, Sacramento 17, North Sacramento 1, Ontario 1, Redlands 1, San Bernardino 5, San Diego County 20, La Mesa 14, National City 3, San Diego 44, San Francisco 131, San Joaquin County 4, Lodi 1, Stockton 7, Tracy 4, San Luis Obispo County 6, Arroyo Grande 1, San Luis Obispo 1, San Mateo County 5, Daly City 1, Redwood City 1, Santa Barbara County 15, Santa Barbara 1, Santa Maria 1, Santa Clara County 12, Mountain View 6, Palo Alto 7, San Jose 8, Sunnyvale 2, Sutter County 4, Tulare County 15, Lindsay 3, Porterville 1, Ventura County 14, Oxnard 1, Ventura 2, Yolo County 5, Yuba County 1.

Diphtheria

21 cases: Oakland 1, Fresno County 1, Kern County 1, Los Angeles County 2, Beverly Hills 1, Los Angeles 6, Riverside County 1, Sacramento 1, San Bernardino County 1, San Diego 4, San Francisco 1, Yuba City 1.

German Measles

46 cases: Albany 2, Berkeley 4, Oakland 2, Eureka 2, Los Angeles County 3, Compton 1, Long Beach 3, Los Angeles 5, Pasadena 1, Bell 1, Yosemite National Park 1, Orange County 1, Santa Ana 1, La Habra 1, Plumas County 1, San Diego 3, San Francisco 5, San Joaquin County 1, Stockton 1, Tracy 1, Santa Clara County 4, Benicia 1, Turlock 1.

Influenza

258 cases: Berkeley 4, Eureka 1, Westmoreland 1, Kern County 7, Kings County 2, Los Angeles County 8, Long Beach 4, Los Angeles 5, Whittier 1, Roseville 223, San Francisco 1, Ojai 1.

Malaria

4 cases: San Joaquin County 1, San Luis Obispo County 1, California 2.*

Measles

293 cases: Berkeley 2, Oakland 10, Fresno County 2, Fresno 1, Imperial County 5, El Centro 1, Kern County 18, Los Angeles County 8, Beverly Hills 1, Glendale 3, Long Beach 25, Los Angeles 19, Pasadena 1, San Gabriel 1, San Marino 1, Yosemite National Park 1, Carmel 1, Orange County 3, Anaheim 2, Colfax 10, Lincoln 6, Roseville 10, Plumas County 2, Riverside County 3, Corona 3, Sacramento County 34, Sacramento 31, North Sacramento 1, San Bernardino County 1, Chino 1, San Diego 7, San Francisco 2, San Joaquin County 2, Stockton 1, San Luis Obispo County 7, Santa Barbara County 1, Santa Barbara 1, Santa Clara County 2, San Jose 3, Sutter County 1, Tulare County 2, Ventura 1, Davis 1, Yuba County 19, Marysville 18, Wheatland 18.

Mumps

907 cases: Alameda County 2, Alameda 8, Berkeley 22, Oakland 25, San Leandro 1, Gridley 6, Oroville 1, Contra Costa County 4, El Cerrito 1, Martinez 1, Pittsburg 18, Fresno County 17, Fresno 5, Willows 4, Humboldt County 10, Eureka 10, Kern County 6, Kings County 11, Hanford 11, Lemoore 24, Los Angeles County 112, Alhambra 6, Beverly Hills 3, Burbank 2, Compton 15, Glendale 2, Hermosa 2, Huntington Park 5, Long Beach 4, Los Angeles 40, Manhattan 1, Monrovia 1, Pasadena 17, Pomona 2, Santa Monica 6, Sierra Madre 1, Whittier 1, South Gate 2, Madera 1, San Rafael 2, Yosemite National Park 1, Monterey County 4, Monterey 2, Napa 2, Orange County 12, Anaheim 3, Fullerton 5, Santa Ana 18, Riverside County 9, Corona 1, Hemet 6, Riverside 16, Sacramento County 2, Sacramento 7, San Bernardino County 5, Colton 1, Ontario 8, Upland 8, San Diego County 4, Coronado 2, La Mesa 10, National City 4, San Diego 106, San Francisco 184, San Joaquin County 3, Stockton 5, San Luis Obispo County 3, San Luis Obispo 1, Daly City 8, Santa Barbara County 1, Lompoc 1, Santa Barbara 3, Santa Clara County 6, Mountain View 1, San Jose 11, Stanislaus County 1, Sutter County 3, Tulare County 9, Exeter 9, Ventura County 6, Fillmore 1, Ventura 1, Davis 1, Woodland 1.

Pneumonia (Lobar)

65 cases: Berkeley 3, Oakland 2, Contra Costa County 1, Humboldt County 4, Eureka 2, Kern County 2, Lassen County 1, Los Angeles County 8, Alhambra 1, Hermosa 1, Inglewood 1, Los Angeles 20, Santa Monica 2, Whittier 1, South Gate 1, Maywood 1, Orange 1, Colfax 1, Riverside 1, Sacramento 2, Ontario 1, San Francisco 4, San Mateo 1, Santa Barbara 2, Tulare County 1.

Scarlet Fever

241 cases: Alameda 2, Albany 2, Berkeley 1, Oakland 8, Butte County 3, Chico 5, Gridley 1, Oroville 1, Colusa 1, Contra Costa County 3, Martinez 4, Walnut Creek 1, Fresno County 8, Fresno 7, Sanger 3, Orland 1, Humboldt County 2, Eureka 4, Kern County 7, Bakersfield 1, Lassen County 1, Los Angeles County 18, Avalon 1, Beverly Hills 1, Compton 2, Glendale 1, La Verne 1, Long Beach 1, Los Angeles 26, Monrovia 2, Pasadena 1, Pomona 2, Santa Monica 3, Maywood 1, San Rafael 1, Mariposa County 1, Fort Bragg 1, Monterey County 1, Carmel 1, Orange County 1, Anaheim 2, Santa Ana 2, Riverside County 9, Riverside 2, Sacramento County 1, Sacramento 6, San Bernardino County 4, Colton 2, San Bernardino 3, San Diego County 3, San Diego 3, San Francisco 24, San Joaquin County 2, Stockton 4, San Luis Obispo County 2, Paso Robles 2, Daly City 1, Menlo Park 1, Santa Clara County 3, Palo Alto 2, San Jose 1, Santa Cruz County 1, Tulare County 12, Exeter 2, Lindsay 7, Porterville 4, Ventura 1, Yolo County 3.

Smallpox

27 cases: Berkeley 2, Oakland 1, Kern County 1, Los Angeles 5, Redondo 1, Sierra Madre 1, Huntington Beach 1, Riverside County 2, San Diego 8, Siskiyou County 4, California 1.*

Typhoid Fever

7 cases: Los Angeles County 1, Beverly Hills 1, Los Angeles 2, Riverside County 2, San Francisco 1.

Whooping Cough

650 cases: Alameda County 10, Alameda 3, Berkeley 4, Oakland 6, San Leandro 4, Butte County 1, Gridley 4, Oroville 19, Colusa 2, Contra Costa County 1, Walnut Creek 6, Fresno County 35, Fresno 24, Selma 3, Willows 18, Imperial County 1, El Centro 1, Imperial 5, Westmoreland 2, Kern County 8, Kings County 5, Hanford 5, Los Angeles County 44, Alhambra 1, Beverly Hills 2, Burbank 8, Claremont 9, Compton 3, Culver City 4, El Monte 2, El Segundo 1, Glendale 4, Huntington Park 3, Inglewood 1, Long Beach 8, Los Angeles 117, Manhattan 8, Monrovia 7, Pasadena 18, Pomona 2, San Fernando 2, Santa Monica 11, South Pasadena 1, Whittier 5, South Gate 1, Madera County 2, Orange County 2, Anaheim 2, Newport Beach 3, Santa Ana 3, Laguna Beach 1, Colfax 1, Plumas County 3, Riverside County 9, Corona 11, Riverside 4, Sacramento County 2, Colton 12, Ontario 2, Redlands 5, San Bernardino 2, Upland 3, San Diego County 5, La Mesa 1, San Diego 5, San Francisco 37, San Joaquin County 20, Lodi 3, Stockton 8, San Luis Obispo County 4, Arroyo Grande 1, Paso Robles 2, San Luis Obispo 1, Burlingame 2, Menlo Park 2, Santa Barbara County 4, Santa Barbara 8, Santa Maria 3, Santa Clara County 1, Stanislaus County 10, Modesto 4, Oakdale 3, Turlock 1, Sutter County 2, Tulare County 5, Lindsay 5, Ventura County 3, Ventura 2, Davis 1, Yuba County 3, Marysville 8.

Meningitis (Epidemic)

One case: Oakland.

Dysentery (Amoebic)

7 cases: Oakland 2, Long Beach 2, Los Angeles 1, Sacramento 1, San Luis Obispo County 1.

Dysentery (Bacillary)

2 cases: Alhambra 1, Santa Monica 1.

Ophthalmia Neonatorum

One case: Hayward.

Pellagra

4 cases: Los Angeles County 1, Los Angeles 2, Lynwood 1.

Poliomyelitis

4 cases: Kern County 1, Long Beach 1, Los Angeles 1, Santa Clara County 1.

Tetanus

2 cases: Los Angeles.

Trachoma

One case: Holtville.

Encephalitis (Epidemic)

One case: Long Beach.

Jaundice (Epidemic)

3 cases: San Francisco 2, California 1.*

Rabies (Human)

One case: Imperial County.

Food Poisoning

19 cases: Los Angeles County 9, Fullerton 2, San Francisco 8.

Undulant Fever

One case: Albany.

Actinomycosis

One case: Seal Beach.

Coccidioidal Granuloma

One case: Fresno County.

Septic Sore Throat (Epidemic)

5 cases: Lake County 3, San Bernardino County 2.

Rabies (Animal)

61 cases: Fresno County 3, Kings County 4, Los Angeles County 7, Glendale 5, Huntington Park 1, Inglewood 1, Long Beach 2, Los Angeles 29, Montebello 1, San Fernando 1, Santa Monica 2, Torrance 1, West Covina 1, South Gate 1, Monterey County 1, Watsonville 1.

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* Cases charged to "California" represent patients ill before entering the State or those who contracted their illness traveling about the State throughout the incubation period of the disease. These cases are not chargeable to any one locality.

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